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ABSTRACT

The last of a three-part series on computer-assisted instruction (CAI), this report describes microcomputer applications in special education, music, visual arts, speech arts and drama, home economics, and industrial/vocational arts. Under each subject heading, current and developing computer applications are discussed and specific courseware developed by MECC (Minnesota Educational Computer Consortium) is described. In special education, computer systems have been developed to aid blind, deaf, speech-impaired, motor-control handicapped, and intellectually handicapped students. Developments in the fine arts include electronic music synthesizers, a computer-feedback keyboard instrument that teaches how to play, computer graphics for visual arts, and set design courseware for drama. In the practical arts, courseware has been developed for a wide range of home economics and industrial/vocational arts applications, from nutrition and family planning to driver training, money management, and home improvement. Seven examples are then provided of programs currently operating in these areas at high schools across the country. At the head of each description are the name and address of the school or agency and the name and position of a contact person. (TE)

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Part III

Microcomputer Instruction in Special Education and the Fine and Practical Arts

Some skeptics not yet ready to "boot" into CAI (Computer-Assisted Instruction) might not apply the terms *humane* and *creative* to its advantages. But teachers who *have* booted in would — especially those who teach in special education and the arts.

Micros are humane, patient, non-censorious instructors, say special ed teachers. Micros enable students to freely express their values and ideas in creative ways and with self-confidence, say teachers of the fine arts.

"A year ago I vowed I'd never have anything to do with computers," said Marjorie Burkland, special ed teacher at Evanston (Ill.) Township High School. "Now, I'm all for them. I've seen how they really help my students proudly overcome their speech defects."

Many consider the computer a tool for only the physical sciences and mathematics. But as a spur to creative human thought and expression, the micro is a learning, often inspiring aid throughout the curriculum.

Special Education

Microcomputers are proving to be a boon to students with identifiable physical, mental, perceptual, and emotional handicaps. In special education or mainstreamed classes, in special schools, a private room, or at home, the micro is providing windows to the outside world.

Deaf students in a nationwide pilot project can communicate with each other by means of a computer and MODEM (Modulator/DeModulator), a device that changes a computer's binary code into audio tones or sound waves that can be transmitted or received via telephone and then translated from "soft copy" into "hard copy" (the written word) on the micro screen by a printer.

With the voice synthesizer, the computer becomes a communication aid for the visually impaired. Written messages stored in the micro can be sounded out, simulating human speech. Optical scanners enable the blind to read unassisted. Using the scanner and voice synthesizer with the micro, the blind person can read any typed information.

Although very expensive for school systems to buy, a new computer product, Braillex, holds promise for the visually impaired. It is a paperless Braille system that functions like a word processor, but instead of a screen, the Braillex uses a strip of pins that pop up and down to form the Braille characters. With the machine, a student can tape notes, store them in a cassette, write assigned papers, edit them, and print them out in either Braille or regular type. Using the Braillex, they can program computers and access data banks.

Students with delayed speech development can use either a computer printer to make a hard copy, or the micro screen soft copy with a voice synthesizer to produce an oral communication.

Hearing-impaired students who have speech defects use a technique in which a word is spoken correctly then reproduced as an electronic image of the sound which is then displayed graphically on the monitor. The student says the word and compares the image of his or her voice with the original image.

Students who are motor-control handicapped are helped to manipulate objects when they use a touch keyboard or a joystick to type messages to the micro so that it controls MODEMS, motorized wheelchairs, and home appliances. Researchers at Behavioral Engineering in Scotts Valley, Calif., are developing and testing educational computer games that users can control by holding a galvanic skin response device and *thinking* about what moves to make. The principle is that of polygraph tests: thoughts affect perspiration rate and skin resistance. Three such software games programmed by Robert Dilts of Behavioral Engineering are available for the Apple, Atari, Commodore 64, and VIC 20.

CAI can assist the intellectually handicapped with a variety of drill and practice programs in an unemotional, encouraging way that enables achievement. The teacher records student performance levels and monitors progress without being personally involved in the drill and practice.

The Oregon Council for Computer Education has published *Special Report: Computers in Special Education*, which cites the advantages of a computerized instructional system for the special education student:

- Active learning with high student response rate
- Immediate feedback and reinforcement
- Maintenance of attention
- Individual pacing of instruction
- Infinite patience with sufficient repetition to ensure learning

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MECC (Minnesota Educational Computer Consortium) has developed three new highly rated Apple II diskettes for preschool through adult levels in special education:

Blissymbols: Bliss Drills facilitates learning of Blissymbols. The "Single Symbol Drill" program presents a stimulus symbol for the student to match against three test symbols. "Word-Symbol Drill" gives practice in matching symbols against their word representations. Both programs operate through a switching device, game paddle, or simple keyboard contact. Fourteen pre-stored sets of symbols are available with which to configure drills. With "Drill Maker," a teacher can create additional symbol sets.

Blissymbols: Bliss Library and *Blissymbolics: Blissboard* are more advanced sequels to *Blissymbols: Bliss Drills*.

Two other series of courseware widely used in special education and reviewed and recommended by the Department of Technology of the Houston Independent School District (see January 1984 *Curriculum Report*) are produced by Hartley Courseware, Inc. and the Milliken Co. for Apple II micros.

Music

Aaron Stern, dean of Chicago's American Conservatory of Music, believes that computers are shaping the future of musical composition. "They are dramatically affecting the way people compose and the way we educate," Stern said in a recent interview.

The conservatory has applied for a grant from the Ford Foundation to expand its use of computers as both compositional and teaching tools.

Available computer programs allow the user to compose music for up to 16 voices, play music entered in the computer, display notes on the monitor, edit written musical compositions, and listen to music through stereo amplifiers.

Electronic music is not new after nearly 50 years of composition and performance. Computer music is not new either. The basic hardware and software were developed in the early 1960s. What *is* new is the microchip and other technology that have greatly improved the capability of sound imitation, ranging from synthetic noise, to acoustical instruments, to human voices.

Orchestra — 800 (TRS-80), for example, is a new software. "Orch," as its fans call it, allows the user to code and play music in as many as four simultaneous voices over a six-octave range. Unlike earlier computer music, "Orch" produces sound without synthesizers or complementary recording devices.

The sounds to be generated, imitations of musical instruments, or new sounds created by the composer, are described in digital language. To describe one note can take 50,000 numbers. More numbers raise the fidelity. After the digital description, the sound is converted to analogs, electrical impulses that are then played through normal speakers.

For music instruction, software has been programmed to provide CAI drills in determining interval distance, writing or identifying scales, recognizing rhythm patterns, recognizing whole and half-steps, identifying which note in an observed phrase was played wrongly, and stating the type of triad played. These drills help students learn to read sheet music and to recognize patterns.

Teachers of music appreciation frequently present a theme in a work of music. It is hard, though, for an untrained, non-performing music student to trace a repeated segment when listening to a full orchestra on record or tape. But when segments are stored in a computer, teachers have control over which parts or voices to play. They can repeat a segment, adding or deleting voices so that the students can trace a major or minor theme more readily.

MECC has produced a courseware program, *Music Theory*, for beginning through advanced levels. Eighteen music theory lessons combine Apple graphics and sound for drill and practice on music fundamentals: terms and notations, rhythm, pitch, intervals, scales, and chords.

The California Educational Software Evaluation Consortium recommends six music programs, all for Apples, produced by Micro Music: *Arnold*, *DoReMi*, *Interval Mania*, and *Melodious Dictator*, drill and practice and problem-solving modes for grades 4-12; *Sir William Wrong Note*, drill and practice and problem solving for grades 10-12; and *Music Composer*, an authoring system, grades 10-12.

In February 1984, Kimball International's piano and organ division introduced a new computer hardware — actually a new musical instrument — the Kimball Z-50 with MusicPlus™ Computer. It is the first organ-like instrument of its kind, with a built-in computer and TV screen just above the upper keyboard, designed to teach a student how to play the instrument.

Controlled by a digital computer, the screen displays a multi-teaching program. Computer generated graphics number the students' fingers. The Z-50 MusicPlus plays to the student, listens to the student play the same passage, plays back the rendition, and proposes necessary improvements.

If the student holds a note too long, for example, a large "Ouch!" appears on the screen. But if the student plays correctly, the screen flashes, "Next stop — Carnegie Hall!"

Visual Arts

"There were writers before Gutenberg and painters after photography was invented," says Warren Wake, assistant professor of design at Carnegie-Mellon University. "Computers don't change the need for creativity."

Computers have contributed a new form to the fine arts — the creation of a picture that is neither photograph nor painting but a unique work of new art.

Computer graphics is the medium of this new art form. Television commercials, logos, cartoon shows, sport arenas' large display boards, changeable message boards atop buildings, billboards, and newspaper and magazine artwork are all examples of computer graphics. This art form, combining color, animation, and often sound, is a major new part of schools' fine arts curricula.

One method of generating a computer image for transfer to paper, TV screen, or electric sign is the digitalized image. The artist draws the representation on a paper grid that corresponds to the number of dots on the TV screen

or sign and then translates the design to computer data for reproduction on the monitor. The Atari, Apple II, and Commodore 64 enable students to graph easily in color.

Another method of generating a computer image employs algorithms that are part of a computer program. With the random number generator, students program the computer to select a color or character and project it rapidly onto the screen. Working with equations of lines, circles, and sine curves helps students to master computer art.

But they don't have to know equations to create a curve, drawing, or cartoon. They can use graphic tablets on which they draw figures with an electronic pen. The electronic board transfers the images to computer memory and a color printer transfers it to hard copy.

Using the mathematics of movement in the plane of three-dimensional space, students can create Escher-like drawings. They build graphics models of objects and then rotate them to see, in perspective, from any point of view.

Delta Drawing is one of a number of programs inspired by LOGO's turtle graphics. Published by Spinnaker Software, *Delta Drawing* is designed for the Apple II Plus with color monitor. A simplified drawing program, it is appropriate for young children, but has such sophisticated features as random command and automatic repeat that it fascinates older students and adults as well.

Another artistic tool program is *Paint*, published by Reston (Va.) Publishing Co. A group of programmers at the Capital Children's Museum in Washington, D.C. created *Paint* for the Atari. The courseware includes "Simple Paint" and "Super Paint" programs.

MECC produces a sequential and self-paced instructional Apple II diskette, *Art-Perspective Drawing*. Through computer graphics, problems of one and two-point perspectives are illustrated, and terminology explained. Designed for grades 7-12, the courseware employs drill and practice and tutorial modes of instruction.

MECC also produces *Aestheometry*, a tutorial and problem-solving program for grades 7-12. *Aestheometry* focuses on the topic of curves by viewing them from two perspectives.

Speech Arts and Drama

Speech arts students are enhancing their learning with micro help. When preparing speeches or debates, they can use micros and MODEMs to communicate with data bases such as *The Source* at the Library of Congress for up-to-date information for their research. The word processor also helps them prepare notecards and outlines for oral presentations.

In their television production classes, students prepare graphics for transmission of logos, announcements, and titles of TV programs. *Set Design* courseware helps arrange backgrounds for talk shows and interviews.

For drama, students are learning set design, stage lighting, and playwriting with the help of micros. "They used to use Scotch tape and throw paper on the floor," says Akram Midani, dean of the College of Fine Arts of Carnegie-Mellon University. "But the art of constructing a dramatic text is beautifully suited to the word processor's capability."

Home Economics

High school home economics departments utilize CAI in child development, clothing and textiles, consumer education, foods and nutrition, food services, family relations, housing, interior design, beauty culture, and HERO (Home Economics Related Occupations) classes.

Students enrolled in home ec courses that prepare them for careers in the food services-hospitality industry use micros to help them learn the skills of commercial food preparation: organizing personnel and time schedules, planning menus, comparing food costs, preparing market orders, and cooking and serving meals for large groups.

Students in foods and nutrition courses learn from such courseware as MECC's *Food Facts, Nutrition I* and *Nutrition II*, and the "Conversion" program from *Mathematics I*. All are designed for Apple II Plus.

Catherine Leisher, executive director of the Home Economics Education Association (1201 16th St., NW, Washington, D.C. 20036), is enthusiastic about CAI in the many areas of the home ec curriculum. She calls particular attention to the excellent courseware at Lyons Township High School, LaGrange, Ill., designed by five of its home ec teachers: *Guest Check Computation, Recipe Adjustment, Square-Footage and Cost Computation, Analysis of Problem and Strength Areas for a Couple Planning Marriage, HERO Class Payroll Simulation, Preschool Counting and Numeral Identification, Maternal Nutrition in Prenatal Development, Menu Analysis, Birth Defect Situation Analyzation, Genetics Review Quiz*, and *Review of Prenatal Development Terms Through Games*.

Industrial and Vocational Arts

Computer graphics are as important to school industrial arts departments as they are to visual arts departments. The domain of graphics communication has moved to computer-based artwork and production.

A recent issue of *U & lc* (Upper and lower case), the international journal of typographics, set the focus: "New kinds of typesetters and electronic page makeup devices, graphics creation stations, display terminals, and electronic/digital typesetting of color halftones are commercial realities. High schools offering graphic arts courses need to provide students with adequate training in the new computer uses."

Industrial and vocational arts courses in architectural drafting, auto mechanics, industrial related occupations, house wiring, electricity, climate control, environmental control, photo/offset printing, mechanical drawing, small engine mechanics, building trades, and aviation, mechanics, and woods technologies can enhance students' learning and skills development with CAI.

MECC offers the courseware, *Drivers' Education/Industrial Arts* (junior/senior high-adult) that includes three particular programs for industrial arts students. In "Micrometer" they learn to read a micrometer from a graphic display of one showing a randomly chosen measurement; "Rafter" and "Stairs" are problem-solving programs that quickly perform the necessary calculations

to design house rafters and stairs based on data the student enters.

Energy conservation, a topic of worldwide concern, offers one of the realistic methods of alleviating problems created by the earth's depleted energy resources. MECC's courseware *Heatloss* (grade 7-adult) is a problem-solving set of programs that help industrial arts students to determine areas and costs of energy-saving improvements that could be made in their own homes.

Three programs recommended for vocational and consumer education courses by the Houston Independent School District Department of Technology are *Income Meets Expenses, Money Management,* and *You Can Bank on It,* produced by Interpretive Education for grades 5-9 for use on the Apple II Plus.

Three Lyons Township High School teachers have created six industrial technology CAI programs that use tutorial and text/quiz modes of instruction: *English Measuring System, The Metric Measuring System, EVM — Using the Resistance Function, The Printer's Measuring System;* and *Aviation Weather Tutor* and *Aviation Weather — FAA Practice,* both of which also provide drill and practice.

Frank B. Kellogg High School, Litile Canada, Minn., is noted for its Computer Assisted Graphics course. One of its students' projects is setting type and printing the school newspaper.

Exempli Gratia

EVANSTON TOWNSHIP HIGH SCHOOL, 1600 Dodge Ave., Evanston, Ill. 60204. *Contact:* Jane Rainville, coordinator of instructional computing services.

ETHS celebrated its 100th birthday on August 31, 1983. During its 100 years, the school has been in the vanguard of educational innovation, and this year is no exception, as two of its newest projects flourish: regular Cablevision telecasts over two public access channels to the community, and its new curriculum-related Microcomputer Center.

Before 1982, ETHS had one classroom with 11 Apple II Plus micros, used primarily for math and science instruction. For the 1982-83 school year, two micro labs and a teacher workroom were outfitted as a Microcomputer Center.

The Microcomputer Lab for classroom instruction and individual student projects has 10 Apple II Plus micros, three printers, a graphics tablet, and a digital plotter. The other lab, also for classroom instruction, is the Corvus Classroom. Networked via the Corvus Omninet system are three printers and 15 Apple II Plus micros connected to a 20 megabyte hard disk drive which has storage for 108 floppy disks.

This year a third classroom has been added. Also "Corvused," this lab has three printers with 20 Apple IIe micros; resident on its Corvus hard disks are the PASCAL, BASIC, and FORTRAN computer languages. The lab is primarily for math and computer science courses.

Jane Rainville, instructional computer coordinator, is also chair of the school's Instructional Computer Steering Committee, which consists of 20 department heads. Each department is encouraged to explore CAI, though not coerced to do so.

"Micros enable students to freely express their values and ideas in creative ways and with self-confidence. . . "

Susan Bords, special education teacher, takes hearing-impaired students to the Microcomputer Center for work on language and math. Speech-language specialist Marjorie Burkland takes her delayed-language-development students to the center to use Hartley Courseware, Inc. programs. She especially recommends *Antonyms.* Students needing remediation go to the center for extra help in their mainstream courses.

Plans are complete for a Special Education Lab across the hall from the Microcomputer Center. The department hopes to have the lab in operation during 1984 and is reviewing and evaluating courseware.

Music students go to the center to study basic music terms with Apple courseware. The home ec department students receive instruction with MECC's *Nutrition.* The art department is offering a two-week CAI unit, *Computer Graphics,* with which students use the graphics tablet and KOALA Pad software.

Settled into the ETHS 16-year-old closed circuit TV studio is the new Cablevision operation. Students produce regular Cablecasts with the help of a "souped-up" Apple micro. They use set design courseware and also create color-sound graphics for credits, logos, upcoming program announcements, centennial year event videotapes, sports activities, and interviews with faculty about curriculum.

Ken Krieger, a senior and a lab assistant in the Microcomputer Center, has Cablecast programs to acquaint the public on how graphics are produced. He also teaches other public access channel operators in the Evanston system how to use the Apple to create graphics for their community Cablecasts.

The vocational ed department's consumer education students study a micro unit, *Advertising and Packaging,* and the vocational experiences department students take a micro unit on *Home Interest.* The industrial arts department has a micro in its mechanical drawing classroom where students use the courseware *CAD (Computer Assisted Design.)*

The Freshman School sends 9th graders to the center for a two-week unit of word processing with *The Bank Street Writer.* Through the math department, freshmen also take a two-week course in computer literacy.

To augment all students' computer awareness, on January 19, 1984, students went to the school's Little Theater to view *Computers: Expressway to Tomorrow.* Produced by Rick Trow Productions, Willow Grove, Pa., and made available through Atari, the 40-minute show combines a live performance with dual-synchronized film

projection and hi-fi. It gives insights into computer art, music, robots, and society as well as tips on programming and CAI. Rainville highly recommends it.

The business education department has a micro lab in its own section of the school with terminals to the IBM mainframe. The connection is "dumb," said Rainville, in that there is no way students can break into the school's administrative mainframe-stored records. Computer Technology is a business ed department course for freshmen. Courses in COBOL and Assembler are also offered as are keyboarding and word processing.

Other departments that make frequent use of the Microcomputer Center are the science, foreign languages, and social studies departments.

GEORGE WASHINGTON HIGH SCHOOL, 655 S. Monoco Parkway, Denver, Colo. 80220. *Contact:* Irwin J. Hoffman, mathematics and computer science teacher.

First featured in the *Exempli Gratia* section in Part II (Jan. 1984) of this *Curriculum Report* series, George Washington High reappears with a description of its CAI in special education and the fine arts.

Since September 1983, the Shared Resource Computer Lab has been serving students who are mentally retarded or who have significant behavioral problems, personality disorders, or learning disabilities. Attitudinal changes among these students and higher motivation already are apparent. They enjoy the unthreatening patience of the micros. Mainstreamed in the lab and indistinguishable from others there, these students feel important because they know they are dealing with the latest technology.

They are learning with LOGO to improve logical thinking. LOGO allows immediate programming with turtle graphics feedback and it emphasizes concretion of abstract ideas and problem-solving skills. It provides an introduction to other computer languages and enables the talented special ed students to enter the regular math curriculum. They also learning keyboarding and word processing with *The Bank Street Writer*. Those who display writing talent learn to use *Wordstar*.

Through teacher-made materials, students remediate their perceptual problems, improving hand-eye coordination, figure-ground recognition, and spatial relations.

Ted J. Brucker, special ed teacher, says, "The computer is a real asset for my students. We are seeing much improved behavior control, academic skills, motivation for school and learning. Because of their improved self-concept, the students are enjoying school."

The HOLD YOUTH class is for potential dropouts. It has an interdisciplinary approach to math, English, social studies, science, and guidance, and uses APX (Atari Program Exchange) courseware in the computer lab. Teachers Ron Epstein and Tim Larsen believe the students are improving in their incentive to attend school. They always arrive in time for a period in the micro lab and complain if for any reason lab has to be skipped. Their math and English skills have improved and their standardized test scores have risen.

MINNESOTA STATE DEPARTMENT OF EDUCATION, Capitol Square Building, 550 Cedar St., St. Paul, Minn. 55101. *Contact:* Susan Vaughan Kamla, music education specialist.

Fifty-eight principals, district decisionmakers, and music teachers from 38 Minnesota schools participated in a three-day inservice study of micros in music instruction. This training program in October 1983, directed by Kamla, featured guest clinician David Williams of Illinois State University and one of the founders and software engineers of TAP/Micro-Music.

The inservice study was part of *The Effects of Computer Instruction in Music in Minnesota Schools* evaluation project. The evaluation phase continues during January-March 1984.

Courseware displayed and evaluated at the workshop included Micro-Music's *Music Composer, Sebastian, Music Lovers Guide: General, DoReMi, Makas Key Signatures, Makas Rhythm, Melodious Director, Harmonious Director, Arnold, Interval Mania, Toney, Microbrass Series*, and MECC's *Music Theory* and *Teachers Aide #1*.

The purpose of the project is to train teachers, establish a network of people comfortable in using computers, and determine whether music instruction with select software from MECC and other agencies makes a difference in student achievement in music performance and appreciation.

FRANKLIN HIGH SCHOOL, 8222 South 51st St., Franklin, Wis. 53132. *Contact:* Christine Krueger, Special Education Designated Vocational Instructor.

A 30-minute drive out of Milwaukee, Franklin is a suburban-urban community. Its high school, with 790 students, serves a blue-collar, white-collar, transitional, labor oriented community.

All its academic departments use micros. The CAI program of the special ed department is unique. It serves the educable mentally handicapped, emotionally disabled, and learning-disability students. The department has two Apple micros, purchased with a special Designated Vocational Instruction for Handicapped Students grant from the state.

CAI enables the special education designated vocational instructor to spend 50 percent of her teaching time with the unique vocational needs of the special ed student who is mainstreamed in academic subjects.

Three teachers use CAI with their special ed students in math, vocabulary, and industrial arts, stressing tutorial, drill, and remediation techniques. The Milliken mathematics courseware has been especially effective, the teachers report.

BERKELEY ACADEMY, 2605 Ashby Ave., Berkeley, Calif. 94703. *Contact:* David Sortino, educational coordinator.

Berkeley Academy is a state-funded residential school for severely emotionally disturbed learning handicapped girls. The 20 students are divided into two classes, one for 8

junior and senior-high girls, and one for 12 younger students.

The faculty are enthusiastic about the improved learning of their students with the help of the academy's two Apple and one Atari micros. Maryneil Morris, one of the teachers, believes the calming patience of the computer and reinforcement of learning through drill and practice are effective in making the girls enthusiastic about school.

Besides CAI at the academy, the students and teachers also enroll in the workshops equipped with micros at the nearby Lawrence Hall of Science of the University of California, Berkeley. The staff of the Hall's Center for Multisensory Learning (CML) specialize in providing science learning for disabled youth. In the workshops, orthopedic, learning disabled, and visually impaired students can participate fully in science activities created to meet their special needs.

BLUE MOUNTAIN SCHOOL DISTRICT, Origsburg, Pa. 17961. *Contact:* Victor A. Miller, Federal Projects coordinator.

The I CARE (Individualized Computer Assisted Remedial Education) program of Blue Mountain High School is a course in basic reading and math for educationally deprived vocational students, grades 9-12. The project was state funded for two years and is now on its own. It is state validated for diffusion purposes.

The I CARE project director is prepared to share educational materials and processes through meetings with interested district administrators and workshops for teachers. Computer software, programmed by the teachers and many of the students, is available.

KIEL MIDDLE SCHOOL, Kiel, Wis. 53042. *Contact:* Wayne Krueger, principal.

Students in grades 4-8 at Kiel Middle School enjoy a large and still growing, sophisticated CAI curriculum with more than 15 Apples in a micro lab, and a judiciously selected library of courseware. *LOGO, The Bank Street Writer, Word Handler,* MECC diskettes, the Milton Bradley and Milliken math series, and the Milliken reading series are among the programs used.

MECC's *Food Facts, Nutrition, Grab A Byte,* and *Health Maintenance* assist the home economic classes, and General *Shop Practices,* the industrial arts classes. *Delta Drawing* is used in art classes.

Educationally mentally retarded and learning-disability classes use CAI, as do all spelling, social studies, math, English, gifted and talented, and physical education courses.

Clarification

Don Rawitsch, director of User Services, MECC, wishes to clarify some statements in the *Exempli Gratia* section of Part I of this CAI series (Nov. 1983). He wrote NASSP: "I feel in general that the writer portrayed MECC favorably. However, in several instances the information is either inaccurate or misleading." Below, in parentheses, are the statements from the *Curriculum Report,* followed by Rawitsch's clarifications.

(The MECC Timeshare System was a business deal and very expensive.) "It was indeed expensive but paid off handsomely in propelling Minnesota to the forefront of educational computing. It was an educational service the state supported for nine years. The reference to 'business deal' suggests MECC was out to turn a profit, a gross falsehood."

(MECC gave up Control Data's PLATO programs.) "The MECC Timeshare System was run on a Control Data computer, but MECC never provided PLATO services."

(MECC began to produce courseware under an agreement with Apple computers.) "MECC's effort to produce courseware for the Apple computer has never been tied to support from Apple Computer, Inc. It was done in the interest of serving Minnesota schools on MECC's own initiative."

(MECC allowed the Apple contract to lapse, hoping that by accepting competitive bids from other companies, it might make a better deal.) "There was a brief period when our statewide Apple purchase contract was not in effect. We tried this to see if dealer sales would suitably serve the purchase needs of Minnesota schools. It was by no means a ploy to try to shift our support to other companies. We restarted the Apple contract in response to school district requests that we continue to offer such a service."

(MECC remains closely tied to Apple but has now signed contracts with Atari, Tandy, Commodore, and IBM for courseware.) "MECC's contracts with those other companies are for software development only."

(Schools outside of Minnesota pay an annual fee for the right to duplicate and/or distribute MECC products and services at a discount. This income enables MECC to grow as a non-profit organization.) "This statement is essentially true but would lead some to believe MECC is a non-profit corporation. We continue to be an organizational part of Minnesota state government."

(MECC does not hire expensive whiz kids to write programs.) "We do hire whiz kids. They happen not to be expensive because they are still in school and work for us as student employees."

This *Curriculum Report* was prepared by Barbara Pannwitt.

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